



ARB's Diesel Emissions Programs

California Bus Association
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California Environmental Protection Agency
 Air Resources Board

Presentation Outline

- Background
- Diesel Emission Controls Strategies
- Existing Regulations
- Regulations In Development
 - On-Road In-Use Heavy Duty

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Where California Needs Regional Reductions

8-hr Ozone Annual

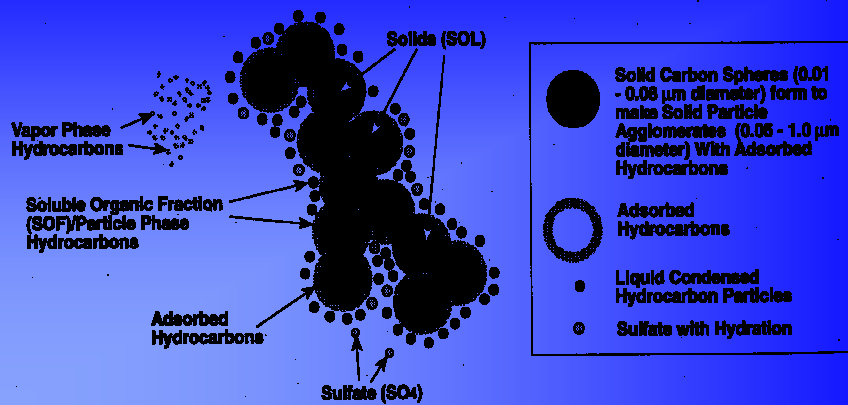


PM 2.5 Annual



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Diesel PM Identified as a Toxic Air Contaminant



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Today's Health Risks Attributed to Diesel PM



- 3,700 Premature Deaths
- 8,500 Chronic Bronchitis Cases
- 100,000 Asthma Attacks and Respiratory Symptoms
- 2,200 Hospital Admissions
- 620,000 Lost Work Days
- 3.6 Million Minor Restricted Activity Days

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Emission Reduction Goals

- **PM strategies intended to:**
 - Reduce exposure risk
 - Reduce mortality
 - Address environmental justice concerns
- **NOx strategies intended to:**
 - Attain ambient air quality standards
 - Reduce mortality

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Diesel Risk Reduction Plan

- **Adopted 2000**
 - 75 Percent Risk Reduction by 2010
 - 85 Percent Risk Reduction by 2020
- **Multiple Strategies**
 - Stringent New Engine Standards
 - Cleaner Diesel Fuel (< 15 ppm sulfur)
 - Ensure In-Use Emissions Performance
 - Aggressive Reductions from In-Use Engines

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Why Reduce In-use Diesel Emissions?

- Diesel Engines are Long Lived
- New Engine Standards Offer Long Term Reductions
- In-use Emission Rules Provide Near-Term Reductions
- Control Technology is Available

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Regulatory Framework for Reducing In-Use Diesel Emissions

- Repower
- Retire
- Use Alternative Fuels
- Retrofit

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ARB Verification Program

- Protects the end user
 - by ensuring after-market diesel emission control strategies obtain claimed emission reductions, and
 - by providing a warranty.
- Verified products based on model year and engine family

<http://arb.ca.gov/diesel/verdev/verdev.htm>

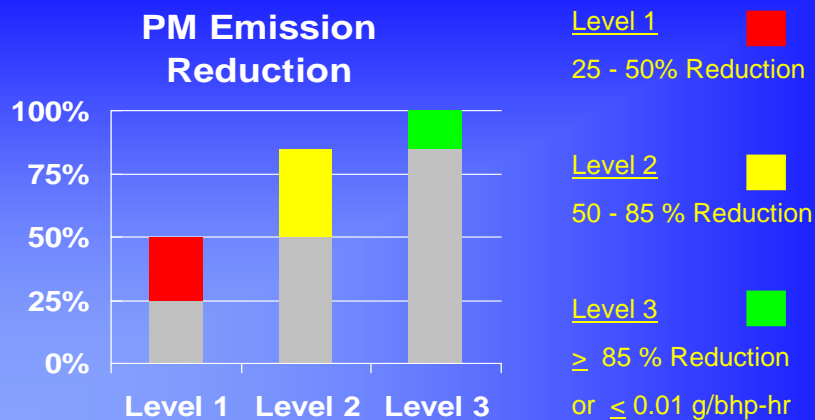
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Diesel Emission Control Strategy Verification Process

- Description of the strategy or device
- Test data, field experience, & test plan
- Durability requirements
 - 50,000 miles or 1,000 hours
- Field demonstration
 - 10,000 miles or 200 hours
- Performance under real-world conditions
- Warranty requirements
 - 150,000 miles for HHD trucks

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PM Verification Levels



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Verification of NOx Reductions

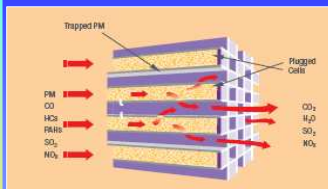
NOx Reduction

$\geq 15\%$

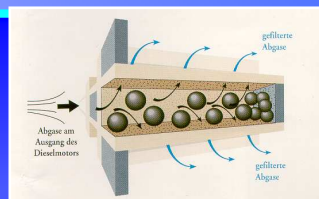
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Verified Technology

Level 1 (25 - 50% Reduction)
Diesel Oxidation Catalyst, some with
crankcase filter.



Level 2 (50 - 85 % Reduction)
Flow-Through-Filter, Emulsified
Diesel Fuel, DOC + Emulsified Diesel
Fuels



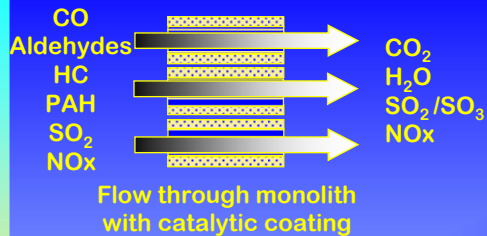
Level 3 (> 85 % Reduction or ≤ 0.01 g/bhp-hr)

Active and Passive Diesel
Particulate Filters



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Retrofit Emission Control Technologies: DOCs Have Largest Experience Base

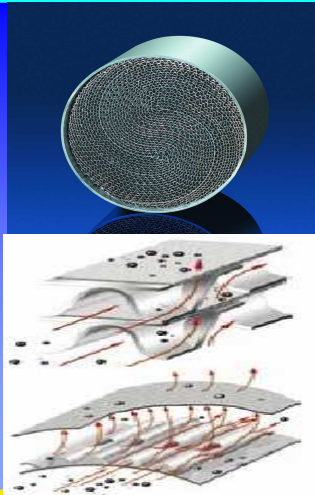


- Level 1 PM Reduction (25-49%)
- Large Reduction in Toxics
 - Carbon monoxide and HC (90%)
- Nearly Universal Application with Millions of Retrofits Worldwide
- Tens of Millions of OE Applications

Diesel Oxidation Catalyst (DOC)

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Flow Through or Partial Flow Particulate Filters

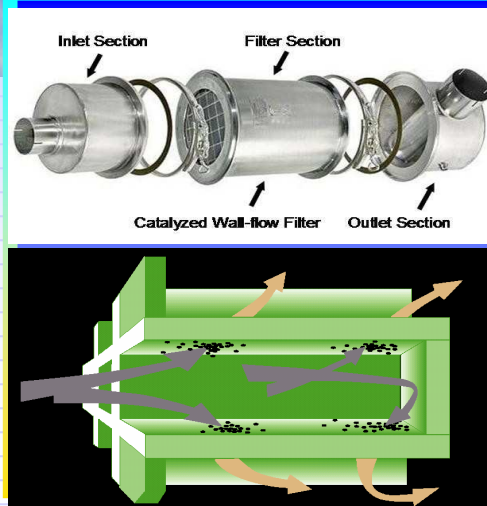


- Level 2 PM Reduction (50-75%)
 - Options include catalyzed filter elements or DOC + uncatalyzed filter
- Has applicability on older engines (e.g., 1991 and newer)
- Minimum exhaust temperature requirements for regeneration
- Filtering achieved with sintered metal sheets (shown) or wire meshes
- Resistant to plugging

Flow Trough Filter (FTF)

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Wall Flow Filters Offer the Highest Filtration Efficiency



Diesel Particulate Filter (DPF)

- Level 3 PM reduction (>85%)
- Large reduction in toxics
 - With catalyst-based filters
- Many ARB verified level 3 filters have minimum exhaust temperature requirements for regeneration (passive)
- Passive DPFs generally applicable to 1994 and newer engines
- > 200,000 Retrofits worldwide
- > 2 Million OE Applications
- Similar filter technology to new 2007 diesel trucks.

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Currently Verified Technologies: Level 3

<http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>

PM Level	Product Name	Technology Type	PM Reduction	NOx Reduction	Applicability
Level 3	Cleaire Flash and Catch CRT	DPF	85%	25%	1994+ on-road (limited - Cummins off-cycle NOx engines); 15 ppm sulfur diesel.
	Cleaire Flash and Catch DPX	DPF	85%	25%	1994+ on-road (limited - Cummins off-cycle NOx engines); 15 ppm sulfur diesel.
	Cleaire Horizon	DPF	85%	N/A	1994-2005 on-road; 15 ppm sulfur diesel; CARB diesel
	Cleaire Longview	Lean NOx Catalyst and DPF	85%	25%	1993-2003 model year on-road; 15 ppm sulfur diesel.
	Clean Air Power	CPF	85%	N/A	Specific 1994-2002 Power System Associates and Caterpillar bifuel engines on-road; 15 ppm sulfur diesel.
	CleanAIR Systems PERMIT	DPF	85%	N/A	Stationary emergency generators; 15 ppm sulfur diesel.
	Donaldson DPM	DPF	85%	N/A	1993-2004 on-road; 15 ppm sulfur diesel.
	International Truck and Engine Corporation DPX	DPF	85%	N/A	1994-2003 on-road Navistar (International); 15 ppm sulfur diesel.
	Johnson Matthey CRT	DPF	85%	N/A	1991-2006 on-road; 2002-2006 Cummins ISM and ISB with EGR; 15 ppm sulfur diesel; B20. Stationary emergency and prime generators. Conditionally verified for stationary pumps.

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Muffler is located on the lower road side rear. It exhausts downward below the bumper

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Basic Exhaust



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DPF Installed in lieu of Muffler



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Existing Regulations

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Existing Regulations

- **Heavy Duty In-Use Inspection Program (1997)**
- **Urban Buses (2000)**
- Solid Waste Collection Vehicles (2003)
- **School Bus Idling (2003)**
- Stationary Engines (2004)
- Transportation Refrigeration Units (2004)
- **Commercial Motor Vehicle Idling (2004)**
- Portable Engines (2004)
- **Transit Fleet Vehicles (2005)**
- Public HDV Fleets (2005)
- **AB 1009 Requirements - Engine Labels (2006)**
- Off-Road Engines (2007)

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Heavy Duty Vehicle Inspection Program: Looking for Excessive Smoke and Tampering

- Updated regulations adopted by ARB in December 1997
- Opacity cutpoints retained
 - 1991+ engines: 40%
 - pre-1991 engines: 55%
- Use of SAE J1667 test protocol
- Looking for tampered engines & emission control equipment (gasoline & diesel engines)
- Administrative appeals through Administrative Law Judge (ALJ) hearing process



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Fleet Rule For Transit Agencies

- Vehicles owned by or operated for Public Transit Agencies
 - Urban Buses
 - powered by or a type normally powered by a heavy heavy-duty diesel engine (>33,000 gvwr)
 - Urban Bus Engine certification required
 - In-Use Fleet Requirements
 - Transit Fleet Vehicles
 - Diesel or alternative fueled vehicle greater than 8,500 gvwr, powered by a heavy-duty engine and not an Urban Bus
 - In-Use Fleet Requirements

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School Bus Idling at Schools

- Applicable to:
 - Buses and Heavy-duty Vehicles
 - All Fuel Types
 - At or Within 100 Feet of K-12 School
 - includes school bus stops and school activity destinations
- Immediately turn off engine and restart 30 seconds before departing
- More Information:

<http://www.arb.ca.gov/regact/sbidding/fro.pdf>

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Commercial Motor Vehicle Idling

- All commercial on-road diesel-fueled vehicles operating in California with GVWR > 10,000 pounds
- Applies to CA based and non-CA based vehicles operating in CA



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Commercial Vehicle Idling Regulations

- Limits the idling to no longer than 5 minutes.
- Cannot idle within 100 feet of residence or school
- Limits diesel-fueled auxiliary power system (APS) to no longer than 5 minutes to a power heater, air conditioning, or any ancillary equipment unless sleeper cab in use and 100 feet from residence or school
- Buses
 - Allowed 10 minutes prior to passenger boarding
 - No limit when passengers onboard

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AB 1009 Requirements

- ARB, in consultation with the CHP, adopted regulations January 1, 2006
- Regulations prohibit HDDVs with non-USEPA certified engines from operating in California
- All HDDEs must have a factory engine certification label - NTC issued – no violation if fixed within 45 days, \$500 if not
- ARB and CHP to enforce regulations starting in 2007

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Regulation in Development
On-Road In-Use Heavy Duty Vehicle
Control Measure

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Scope and Applicability

- All on-road heavy-duty diesel vehicles operating in California
 - Trucks, buses, motor homes, cranes, other
- Includes vehicles designed to be driven on-road, even though they might not be registered to be driven on-road
- Any person, business, or government agency who owns, sells or operates vehicles in California
- Excludes engines subject to other in-use regulations

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Best Available Control Technology (BACT) Standard for Phase 1

- NO_x exhaust emissions less than or equal to NO_x emissions from a 2004 model-year heavy-duty diesel engine, AND
- PM exhaust emissions less than or equal to 0.10 g/bhp-hr PM plus retrofit with highest level DECS.

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Proposed Phase 1 BACT Schedule

Engine Model Years	Compliance Date
Pre – 1994	December 31, 2009
1994 – 1997	December 31, 2010
1998 – 1999	December 31, 2011
2000 – 2002	December 31, 2012
2003 – 2006	December 31, 2013

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Next Workshop Series

- October 18, Redding
- October 19, San Diego
- October 22, Sacramento (webcast)
- October 23, Fresno
- October 24, El Monte
- October 25 , Oakland

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On-Road In-Use HD Control Measure Contacts

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www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm

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www.arb.ca.gov/diesel/diesel.htm

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